

Solar Alpha Rotary Joint (SARJ) Lubrication Interval Test and Evaluation (LITE).

Post-Test Grease Analysis

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Abstract

The Solar Alpha Rotary Joint (SARJ) is a mechanism of the International Space Station (ISS) that orients the solar power generating arrays toward the sun as the ISS orbits our planet. The orientation with the sun must be maintained to fully charge the ISS batteries and maintain all the other ISS electrical systems operating properly. In 2007, just a few months after full deployment, the starboard SARJ developed anomalies that warranted a full investigation including ISS Extravehicular Activity (EVA). The EVA uncovered unexpected debris that was due to degradation of a nitride layer on the SARJ bearing race. ISS personnel identified the failure root-cause and applied an aerospace grease to lubricate the area associated with the anomaly. The corrective action allowed the starboard SARJ to continue operating within the specified engineering parameters.

The SARJ LITE (Lubrication Interval Test and Evaluation) program was initiated by NASA, Lockheed Martin, and Boeing to simulate the operation of the ISS SARJ for an extended time. The hardware was designed to test and evaluate the exact material components used aboard the ISS SARJ, but in a controlled area where engineers could continuously monitor the performance. After running the SARJ LITE test for an equivalent of 36+ years of continuous use, the test was opened to evaluate the metallography and lubrication.

We have sampled the SARJ LITE rollers and plate to fully assess the grease used for lubrication. Chemical and thermal analysis of these samples has generated information that has allowed us to assess the location, migration, and current condition of the grease. The collective information will be key toward understanding and circumventing any performance deviations involving the ISS SARJ in the years to come.